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IS 7587-3 (2006): Cage Suspension Gear for Winding in Mines, Part 3: Shackles and Pins [MED 8: Mining Techniques and Equipment]

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भाग 3 सॉकल और पिन

( पहला पुनरीक्षण )

*Indian Standard*

CAGE SUSPENSION GEAR FOR WINDING  
IN MINES — SPECIFICATION

PART 3 SHACKLES AND PINS

( *First Revision* )

ICS 73.100.40

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BUREAU OF INDIAN STANDARDS  
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NEW DELHI 110002

## FOREWORD

This Indian Standard (Part 3) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Mining Techniques and Equipment Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1980. The experience gained in implementation of the standard has necessitated this revision. Presently 50, 80, 100 and 120 kN capacity shackles only are being used and for 150 and 200 kN capacity suspension gear, chase blocks are being used in place of shackles in mines. Accordingly, in this revision, shackles used with suspension gear of 50, 80, 100 and 120 kN safe working load only are covered, where as in the earlier standard 10, 30 and 150 kN capacity were also covered.

The shackles and pins are used in cage suspension gear assembly to connect the various components of suspension gear to each other. This standard has covered the shackles and pins used to connect the cage hangers, bridle chains and equalizing plates. The shackles and pins used in conjunction with safety hooks are excluded from the scope of this standard since their dimensions have to conform to the dimensions of bell plate to head gear due to the passage of shackles through bell plate.

This standard is issued in eight parts. The other parts in the series are:

- Part 1 General requirements
- Part 2 Cappels
- Part 4 Bridle chains
- Part 5 Distribution plates
- Part 6 Safety detaching hooks (4 plate type) 80, 100 kN capacity
- Part 7 Safety detaching hooks (4 plate type) 120, 150 and 200 kN capacity
- Part 8 Clivey hook suspension arrangements

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding of numerical values (*revised*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

## Indian Standard

# CAGE SUSPENSION GEAR FOR WINDING IN MINES — SPECIFICATION

## PART 3 SHACKLES AND PINS

### *(First Revision)*

#### **1 SCOPE**

**1.1** This standard covers the requirements for shackles and pins for use in cage suspension gear for winding in mines.

**1.2** This standard does not cover the shackles used with safety detaching hooks.

#### **2 REFERENCES**

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
549 : 1974	Specification for split pins ( <i>second revision</i> )
1363 (Part 3) : 1992	Hexagon head bolts, screws and nuts of product grade C: Part 3 Hexagon nuts (size range M5 to M64) ( <i>third revision</i> )
3469 (Parts 1 to 3) : 1974	Tolerances for closed die steel forgings ( <i>first revision</i> )
4218	ISO metric screw threads:
(Part 1) : 2001	Basic and design profiles ( <i>second revision</i> )
(Part 2) : 2001	General plan ( <i>second revision</i> )
(Part 3) : 2001	Basic dimensions ( <i>second revision</i> )
7587 (Part 1) : 2004	Cage suspension gear for winding in mines: Part 1 General requirements ( <i>first revision</i> )
14962	ISO general purpose metric screw threads — Tolerances:
(Part 1) : 2001	Principles and basic data
(Part 2) : 2001	Limits of sizes for general purpose external and internal screw threads — Medium quality

#### *IS No.*

#### *Title*

(Part 3) : 2001 Deviations for constructional screw threads

#### **3 TERMINOLOGY**

For the purpose of this standard, the following definitions shall apply.

**3.1 Top (Main) Shackle** — The shackle used to connect the upper end of distribution (equalizing) plate to the bottom shackle of the safety hook.

**3.2 Bottom (Upper Bridle Chain) Shackle** — The shackle used to connect the lower end of distribution (equalizing) plate to the upper ends of the bridle chains.

**3.3 Cage (Lower Bridle Chain) Shackle** — The shackle used to connect the lower ends of bridle chains to the cage hangers.

#### **4 DIMENSIONS**

**4.1** Dimensions of shackles shall be as given in Fig.1.

**4.2** Dimensions of pins and nuts shall be as given in Fig.2.

#### **5 MATERIAL**

Material for manufacture of shackles and pins shall be as specified in IS 7587 (Part 1).

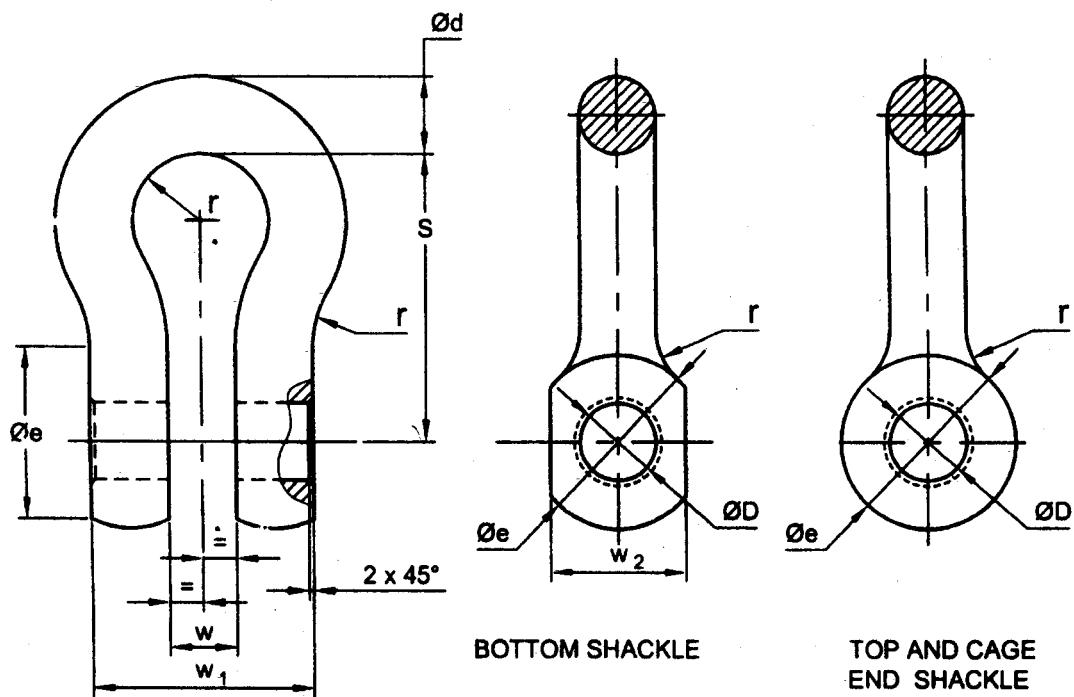
#### **6 GENERAL REQUIREMENTS**

**6.1** The shackles and pins shall comply in all respects with IS 7587 (Part 1).

**6.2** The angularity between two diagonally opposite chains shall not exceed 75° for safe working load up to 50 kN and 60° for safe working loads above 50 kN.

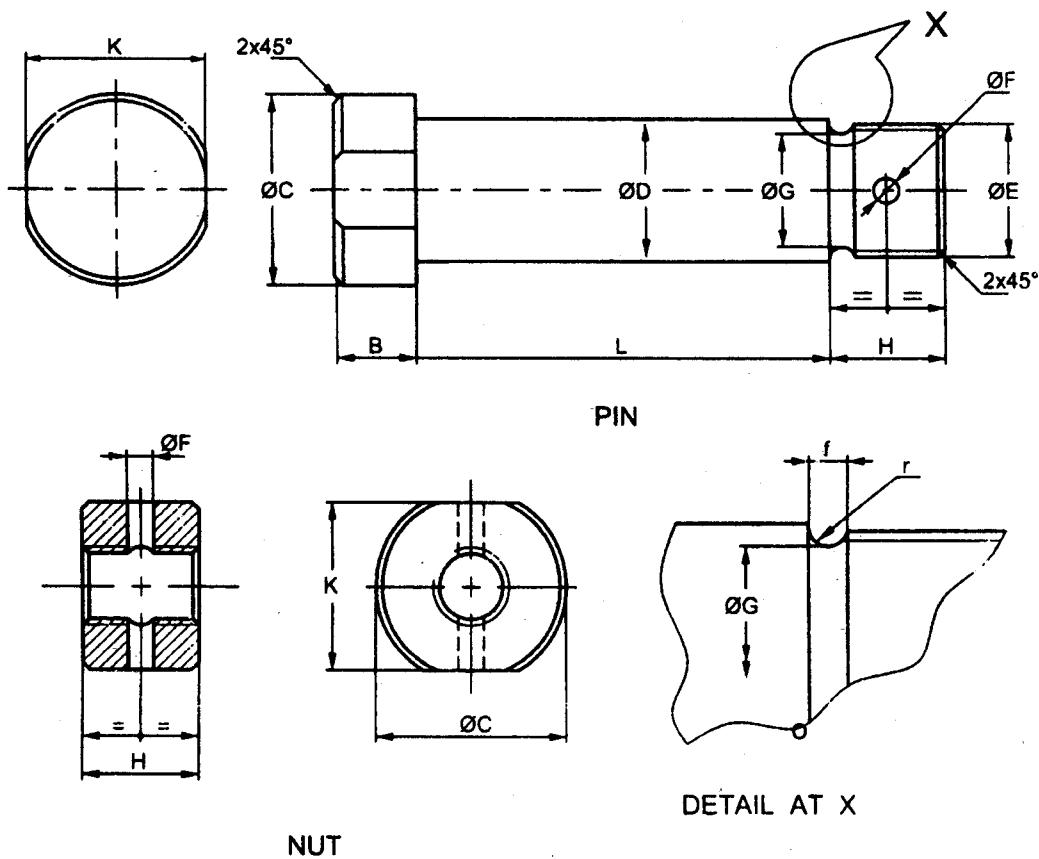
**6.3** The length of the plain portion of the pin shall be such that the nut will seat on the step at the end of the thread and not on the outside face of the shackle body. The nut and pin shall be cross drilled for the split cotter pin in this position.

**6.4** The nut shall conform to IS 1363 (Part 3). The thickness of the nut may be altered to suit the requirements.



<i>SWL of Suspension Gear kN (1)</i>	<i>Name of Shackle (2)</i>	<i>Diameter of Body Material Ød (3)</i>	<i>Hole Diameter ØD H<sub>y</sub> (4)</i>	<i>Inside Width of Jaw W (5)</i>	<i>Bow Radius r (6)</i>	<i>Inside Length S (7)</i>	<i>Eye Diameter Øe (8)</i>	<i>Total Width W<sub>1</sub> (9)</i>	<i>Eye Width W<sub>2</sub> (10)</i>
50	Top	45	45	39	39.5	170	102	129	75
	Bottom	36	36	39	31.5	135	90	111	75
	Cage	30	30	39	26.0	128	75	99	—
80	Top	54	52	52	47.0	203	117	160	85
	Bottom	45	45	52	39.5	170	102	142	85
	Cage	39	39	52	31.5	153	90	130	—
100	Top	61	56	58	49.0	231	126	180	105
	Bottom	52	52	58	43.5	186	125	162	105
	Cage	39	39	58	34.0	166	98	136	—
120	Top	Not Applicable							
	Bottom	55	55	65	40	200	130	177	115
	Cage	46	46	65	35	165	105	150	115

FIG. 1 SHACKLES



SWL of Suspension Gear kN (1)	Name of Pin (2)	$\varnothing D$ g <sub>6</sub> (3)	B (4)	$\varnothing C$ (5)	$\varnothing E$ (6)	$\varnothing F$ (7)	$\varnothing G$ (8)	L (9)	H (10)	K (11)	f (12)	r (13)
50	Top	45	25	60	M 42	8	35.6	130	36	55	5	2.5
	Bottom	36	17	50	M 30	6.3	25	112	24	46	4	2
	Cage	30	15	42	M 24	5	19.6	100	20	36	4	2
80	Top	52	30	70	M 42	8	35.6	161	40	65	5	2.5
	Bottom	45	25	60	M 42	8	35.6	143	36	55	5	2.5
	Cage	39	20	50	M 36	6.3	30.3	131	24	46	4	2
100	Top	56	32	75	M 52	10	45	181	45	70	6	3
	Bottom	52	30	70	M 42	8	35.6	163	36	65	5	2.5
	Cage	39	20	50	M 36	6.3	30.3	137	24	46	4	2
120	Top	60	35	85	M 55	8	50	188	35	75	5	2.5
	Bottom	55	30	80	M 50	8	45	177.5	35	70	5	2
	Cage	46	25	70	M 40	8	35	151.5	25	60	4	2

FIG. 2 DIMENSIONS OF PINS AND NUT

**6.5** The split pin made of mild steel shall conform to IS 549.

**6.6** The pin holes in the bodies shall be drilled in axial alignment at one setting central to the outside diameter of the eye.

**6.7** Dimensions of the pins and shackles shall have tolerances conforming to IS 3469 (Parts 1 to 3).

**6.8** The screw threads on the pins and nuts shall conform to IS 4218 (Parts 1 to 3) and IS 14962 (Parts 1 to 3).

## **7 HEAT TREATMENT**

All shackles after forging shall be heat treated as given below at the temperatures as specified in IS 7587 (Part 1).

<i>Designation of Steel</i>	<i>Treatment to be Given</i>
20C15	Normalizing, hardening and tempering
20Ni2Cr2Mo <sub>2</sub>	

## **8 DESIGNATION**

The shackles shall be designated by the commonly used name, a letter indicating the name of the shackle ('T' for Top shackle, 'B' for Bottom shackle and 'CS' for Cage shackle), safe working load of the suspension gear assembly and the number of this standard.

*Example 1 : A top shackle for cage suspension gear of 80 kN safe working load shall be designated as:*

Top Shackle T80 IS 7587 (Part 3)

*Example 2 : A bottom shackle for cage suspension gear of 80 kN safe working load shall be designated as:*

Bottom Shackle B80 IS 7587 (Part 3)

*Example 3 : A cage shackle for cage suspension gear of 100 kN safe working load shall be designated as:*

Cage Shackle CS100 IS 7587 (Part 3)

## **9 PROOF LOAD TEST**

Each assembled shackle and pin shall be subjected to tensile proof load equivalent to three times the safe working load (SWL) given in Fig. 1 and 2 and shall satisfactorily withstand the load without any permanent deformation or defect. In addition, the requirements of proof load test given in IS 7587 (Part 1) shall apply.

## **10 MARKING**

**10.1** Each shackle and pin shall be marked with the manufacturer's identification mark, safe working load and abbreviated name for material [see 11.1 of IS 7587 (Part 1)].

### **10.2 BIS Certification Marking**

Shackles and pins may also be marked with the Standard Mark.

**10.2.1** The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standards.

**ANNEX A**  
**( Foreword )**  
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### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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